IN THE SPECIFICATION

Please delete the heading "Description" on page 1 and insert the following Title on page 1 instead of the "Description" heading:

SYNCHRONOUS PLAY-OUT OF MEDIA DATA PACKETS

Please insert the following heading and paragraph at page 1, after the Title, as follows:

CROSS-REFERENCE TO RELATED APPLICATION

This application is based upon and claims the benefit of priority from European Patent App. 02 020 070.5 filed September 6, 2002; the contents of which are incorporated herein by reference.

Please insert the following headings at page 1, between line 1 and the heading prior to line 1, as follows:

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

Please insert the following heading at page 1, between lines 2 and 3, as follows:

DESCRIPTION OF THE RELATED ART

Please insert the following heading at page 3, between lines 24 and 25, as follows:

SUMMARY OF THE INVENTION

Please insert the following heading at page 9, between lines 14 and 15, as follows:

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

Please insert the following heading at page 10, between lines 5 and 6, as follows:

DETAILED DESCRIPTION OF THE INVENTION

Please amend the paragraph beginning at page 10, line 6, as follows:

Figure 1 shows the basic scenario of a media distribution session with two synchronized media sinks, i.e. a first media sink 1 and a second media sink 2. The media source 101 transmits a first timestamped media data packet 1021 to the first media sink 1 and a second timestamped media data packet 1022 to the second media sink 2. The timestamp of a media data packet indicates the time the media data packet was generated by the source. The first media sink 1 and the second media sink 2 decode the media data packets in case of encoded data. The data is then stored in respective buffers, i.e. a first buffer 1041 of the first media sink 1 and a second buffer 1042 of the second media sink 2 until the common play-out time 105 for the respective packet is reached. This common play-out time 105 is determined by the media sinks for each packet by adding a once determined play-out time offset to the time indicated by the timestamp of a media data packet. If the common play-out time 105 for a packet is reached the media data packet is played-out by the media sink. In the example of Fig. 1, the timestamps of the first media data packet 1021 and the second media data packet 1022 indicate the same moment in time. Therefore, these media data packets are played-out [[out]] by the first media sink 1 and the second media sink 2 at exactly the same moment.

Please amend the paragraph beginning at page 10, line 29, as follows:

For clocks, it is assumed that in a media-streaming device two clocks are available (accessible): the sample clock and the global wallclock. The sample clock is the clock that is inherent in the media stream. For a CD as an example of a source of an audio stream this sample clock is running with 44.1 kHz. The global wallclock can be read by all source and sink devices participating in a media session. For IP networks, the Network Time Protocol (NTP) describes how a NTP clock can be maintained throughout a network. However, for applications with tight requirements, such as synchronizing two stereo channels, the accuracy and clock resolution of such an NTP clock may not be sufficient. Therefore it is assumed that a clock with much higher accuracy and resolution is available. This is the case in some wireless systems that need a common clock among all peers in order to execute a synchronized frequency hopping. One example for such a wireless system is given according to the ~~Bluetooth~~ <u>BLUETOOTH (IEEE 802.15.1)</u> specification, where all participants of a piconet maintain a common clock. The time of the common clock can be used by media applications as the global wallclock time. Usually, the sample clock time and the global wallclock time are measured in different units. For example, the global wallclock may tick in units of microseconds, whereas the sample clock may tick in units of single samples as smallest unit.

Please amend the paragraph beginning at page 11, line 33, as follows:

In Figure 2 the assumption is made that there is a global wallclock time 201 available to the media source 202 and all n media sinks, i.e. media sinks 203-1, 203-2, … ,203-n. This

global wallclock time can for example be the time of the clock that is used by digital bus systems or wireless digital transmission systems. Furthermore, it is assumed that this clock fulfills the requirements in terms of accuracy and resolution concerning the desired synchronization. Typically, such a clock is located very close to the physical layer, e.g. in the baseband of such a transmission system. For general-purpose devices like a PC or a PDA 202, this means that such a clock is external and can only be accessed via an external connection 204, e.g. USB or RS232. One example for this is a ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) module that is connected to a PC via USB. The ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) baseband clock is synchronized automatically by all devices within a piconet, because this clock information is used to synchronize the frequency hopping of all piconet participants. The native ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) clock information then has to be transported from the ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) module to the PC via the USB bus system.

Please amend the paragraph beginning at page 15, line 29, as follows:

Figure 4 shows a possible scenario where the procedure according to the invention can be applied. A ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) equipped PC 400 is multicasting a stereo audio stream in form of media data packets to two ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) loudspeakers, i.e. a first ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) loudspeaker 4021 and a second ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) loudspeaker 4022, via two ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) links, i.e. a first ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) link 4011 and a second ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) link 4012. In

each link the media data packets of one audio signal of a stereo signal are transmitted to the respective loudspeaker.

Please amend the paragraph beginning at page 16, line 3, as follows:

The ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) module on the PC 400 is connected via USB, whereas in the first ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) loudspeaker 4021 and the second ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) loudspeaker 4022 ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) is embedded directly into the system design. The global wallclock time to be used by the PC and the ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) loudspeakers is the ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) baseband clock inherent in each ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) baseband implementation. This ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) baseband clock is very well synchronized among all participants of a ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) piconet.

Please amend the paragraph beginning at page 16, line 10, as follows:

The PC 400 as the media source of the audio stream starts with evaluating the quality and delay of the ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) transmission to the first ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) loudspeaker 4021 and the second ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) loudspeaker 4022 using the information that is provided by the control packets as defined in RTP. Further, the PC queries the time needed for decoding and the buffer capabilities from each speaker using appropriate signaling commands. With this information and the random variation of the clock information of the PC, i.e. a maximum

possible variation, the PC can determine a play-out time offset. This play-out time offset is transmitted to the first ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) loudspeaker 4021 and the second ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) loudspeaker 4022 once and is added to the time indicated by the timestamp of each media data packet of a media stream to get the common play-out time for each media data packet. In an alternative embodiment of the ~~invetion~~invention, a common play-out time may be determined by the media source, here the PC 400, for each media data packet and then transmitted together with each media data packet, as described in connection with Fig. 6 below.

Please amend the paragraph beginning at page 16, line 25, as follows:

The PC 400 as the media source of the stream creates the timestamps. When RTP media data packets are sent, the timestamps in the media data packets describe the moment in time the packet was created in time units of the sample clock. The link to the global wallclock time, here the ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) baseband clock, is achieved by supplying two timestamps for the same moment in time in the RTCP control packets, one timestamp indicating the moment in time in units of the sample clock and the other one in units of the global wallclock, as described above. Because of the inaccuracy of the clock information available on the PC side, however, the baseband clock is preferably actually read only for the first control packet. For consecutive control packets, the time information for the global wallclock timestamp is created by counting the number of samples passed since the last control packet and then translating this number of samples into time in units of the global wallclock. As mentioned above, a control packet has a global wallclock timestamp indicating

a moment in time in time units of the global wallclock time and a sample clock timestamp indicating the same moment in time in time units of the sample clock time. Therefore, by combining the information provided by the various timestamps present in the media data packets and the control packets, each ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) loudspeaker can determine the moment in time at which a packet was created by the source in time units of the global wallclock time from the timestamp of a media data packet, which indicates the time of creation in time units of the sample clock. By adding the negotiated play-out time offset, it is then determined when the samples from each media data packet have to be played-out. Because each sink can access the ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) baseband clock directly, all sinks are able to synchronize their sample play-out clocks tightly to the ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) baseband clock.

Please amend the paragraph beginning at page 17, line 16, as follows:

Because the clock information is imprecise to a certain extent on the source side, the first ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) loudspeaker 4021 and the second ~~Bluetooth~~ BLUETOOTH (IEEE 802.15.1) loudspeaker 4022 as the media sinks of the audio have to compensate for this inaccuracy with a suitable buffer size. For example, the PC 400 knows that the clock information has a maximum variation of 2 ms. Therefore, in order to avoid the situation that the play-out time of a media data packet has already elapsed once the media data packet reaches the sink it includes these 2 ms in the negotiated play-out time offset. With 2 ms variation, the timestamps created by the source will be 1 ms too early or 1 ms too late in

the worst case. Therefore, the sinks have to provide enough memory to buffer the data for this worst-case period that is always added by the source device in order to be on the safe side.

Please cancel the Abstract at page 30, lines 1-14 in its entirety and insert therefor the following replacement Abstract on a separate sheet as follows: